MONITORING PLAN

PROJECT NO. PO-06 FRITCHIE MARSH

ORIGINAL DATE: July 2, 1996
REVISED DATE: July 23, 1998

Preface

Pursuant to a CWPPRA Task Force decision on April 14, 1998, the original monitoring plan was increased in scope to conform with monitoring of projects of similar type. Specifically, vegetation will be monitored every three years and water level and salinity will be monitored continuously through 2005. Upon collection and evaluation of the water level and salinity data set, the Technical Advisory Group (TAG) will assist in development of a sampling plan based on an approximate 30% reduction of effort, if technically advisable.

Project Description

The Fritchie Marsh Project area contains 6,443 ac (2,607 ha) of intermediate and brackish marsh located southeast of Slidell in St. Tammany Parish near the north shore of Lake Pontchartrain and the Rigolets. The area is bounded by US Highway 190 to the north, US Highway 90 to the south and east, and Louisiana Highway 433 to the west and south (figure 1).

From 1956 to 1984, 2,260 ac (915 ha) of emergent marsh within the project area have been converted to open water, with the greatest loss occurring in the northern project area (SCS 1992). This loss reflects a pattern of marsh deterioration in the project area from north to south due to the lack of freshwater and sediment input in to the northern part of the project. Although the exact causes of marsh loss have not been determined, man-made changes in the hydrological patterns have occurred that may have contributed to this loss. Natural hydrological patterns have been disrupted by the construction of the perimeter highways. These embankments isolate the marsh from the West Pearl River Basin and have restricted inflow of freshwater, nutrients, and sediment. Additionally, saltwater from Lake Pontchartrain enters the marsh through W-14 canal and Little Lagoon during high tides and strong winds (USGS 1985). As a result, the project area has converted from a predominantly fresh marsh in 1956 to a predominantly brackish marsh by 1990 (Kuniansky 1985, LDNR 1990).

The hydrology of the system is affected by rainfall, storm runoff, sewage discharge, gravity drainage, tides and wind driven currents. There are three major points of exchange in the Fritchie Marsh system. The W-14 drainage canal runs from the north along the western side of the marsh to Little Lagoon and Lake Pontchartrain, and serves as the drainage point for storm water runoff and tertiary treated domestic sewage from Slidell. Two other points of exchange for the marsh are the east and west ends of Salt Bayou. Salt Bayou runs east to west near the southern boundary of the project. At the west end, the bayou is 120 ft (36.6 m) wide and connects to Lake Pontchartrain through a 170 ft (52 m) bridge opening in Louisiana Highway 433. At the east end, Salt Bayou narrows to 30 ft (9.1 m) wide and connects to the West Pearl River through a 6 ft (1.8 m) concrete box culvert at US

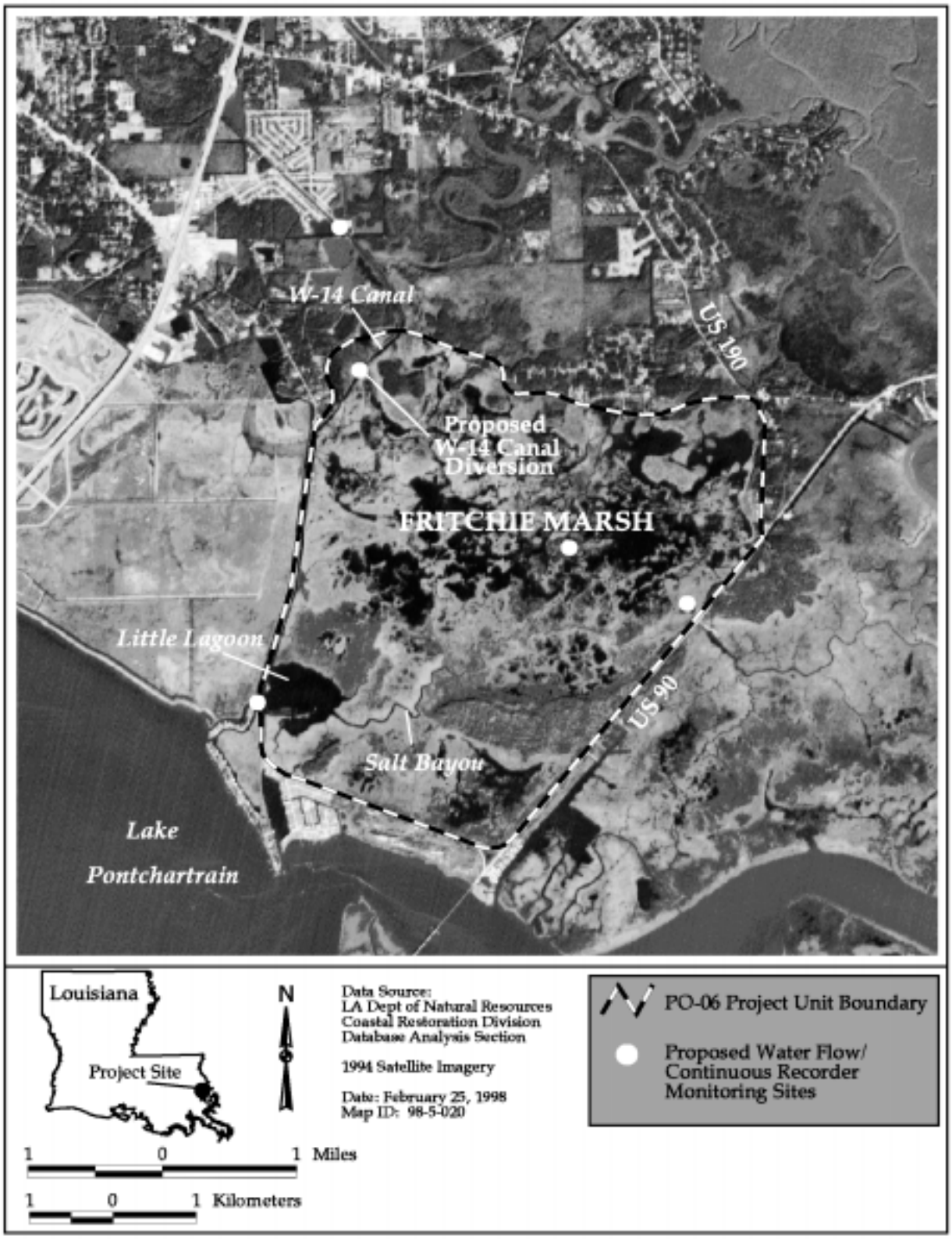

Figure 1. Fritchie Marsh (PO-06) project location and monitoring sites.

Highway 90. According to local residents, Salt Bayou was at one time navigable from the Pearl River to Lake Pontchartrain. However, once US Highway 90 was built, access to the Pearl River was decreased causing the bayou to silt in making navigation impossible.

Vegetation in the southern project area consists of brackish marsh species and is dominated by *Spartina patens* (marshhay cordgrass) (55%), and *Juncus roemarianus* (black needlerush) (30%). The northern project area contains species indicative of intermediate marsh, including *Scirpus olneyi* (three-cornered grass) (5%), *Sagittaria lancifolia* (bulltongue) (5%), and *Typha* sp. (cattail) (5%).

Soils in the project area are mainly Lafitte-Clovelly soils with a tract of Guyton-Abita-Brimstone soil existing within the Apple Pie Ridge and Prevost Ridge (SCS 1990). The Lafitte-Clovelly soils are characterized as level, poorly drained, saline soils having a mucky highly erodible surface. Guyton-Abita-Brimstone soils are poorly drained loamy soils.

The objective of the Fritchie Marsh Project is to reduce marsh loss through the management of available freshwater. Measures for this purpose include diverting part of the W-14 canal outflow to the interior of the marsh to increase freshwater flow into the northern project area. Other measures include the dredging of Salt Bayou for 1 mi (1.6 km) east and west of US Highway 90 as well as increasing the size of the US Highway 90 culvert.

Project Objective

1. The objective of the Fritchie Marsh Restoration Project is to restore more natural hydrologic conditions in the project area resulting in the protection of the existing marsh.

Specific Goals

The following goals will contribute to the evaluation of the above objective:

1. Decrease rate of marsh loss.

2. Increase freshwater flow and promote water exchange into the area from West Pearl River by enlarging the culvert at US Highway 90 and by dredging portions of Salt Bayou.

3. Increase freshwater flow into the northern project area by diverting flow from the W-14 canal.

4. Document species composition and relative abundance of vegetation to evaluate change over time.

Reference Area

The importance of using appropriate reference areas cannot be overemphasized. Monitoring on both project and reference areas provides a means to achieve statistically valid comparisons, and is the most effective means of evaluating project success. The evaluation of sites was based on the criteria that both project and reference area have a similar vegetative community, soil type, and hydrology. Hydrological influences, soil, and vegetation types were analyzed in the selection of a reference area for comparability of data between the reference area and the project area.

A small impounded area that lies between Highway 11 and the Illinois Central Railroad was selected as a proposed reference area for the Fritchie Marsh Project (figure 2). The soil types within this reference area are the Lafitte-Clovelly soils. This soil type is the main soil type in the project area. The project and reference area are both dominated by brackish vegetation with a small percentage of upland forest (LDNR 1990). As with the project area, the proposed reference area is surrounded by levee roads which restrict water exchange. According to DNR GIS information, the project area and the proposed reference area exhibit similar land loss ratios.

Due to the hydrological restrictions of the project area, a reference area with similar conditions, and of comparable size, was difficult to locate. The proposed area exhibits biological and geographical characteristics similar to that of the project area, however, the reference area contains approximately 2,000 ac (800 ha) where the project area contains 6,400 ac (2,590 ha). Size of the area is the only limitation for the evaluation of the habitat mapping and the vegetation monitoring elements. Size of the area and lack of similar hydrological influences prevent this proposed area from serving as a suitable reference area for the evaluation of water flow or salinity. A suitable reference area was not available for these elements, therefore, pre-construction data will be utilized to evaluate project effects.

Monitoring Elements

The following monitoring elements will provide the information necessary to evaluate the specific goals listed above:

1. Habitat Mapping — To document vegetated and non-vegetated areas, color infrared aerial photography (1:12,000 scale with ground controls) will be obtained. The photography will be georectified, photointerpreted, mapped, and analyzed with GIS by National Wetlands Research Center (NWRC) personnel using standard operating procedures documented in Steyer et al. (1995). The photography will be obtained in 1996 (pre-construction) and in 2002, 2008, and 2017 post-construction. It will always be flown at low water conditions.

2. Salinity — To monitor the effects of increased flow of freshwater into the project area at the Salt Bayou culvert, salinity will be recorded hourly at four

Figure 2. Fritchie Marsh (PO-06) reference area.

permanent stations. Two continuous recorders will be placed in Salt Bayou, one in a small channel which branches north from Salt Bayou, and another in the marsh near the diversion of the W-14 canal (figure 1) to monitor hydrologic conditions pre-construction and post-construction. Salinity will be monitored in 1997-1999 (pre-construction) and in 2000-2005 (post-construction). Upon collection of this data set, the TAG will assist the CRD Monitoring Manager with evaluation of the data and development of a sampling plan based on an approximate 30% reduction of effort, if technically advisable.

3. Water Level

To monitor the effects of increased flow of freshwater water into the project area at the Salt Bayou culvert and its effect on the marsh, water level will be recorded hourly at four permanent stations. Two continuous recorders will be placed in Salt Bayou, one recorder will be placed in a small channel which branches north from Salt Bayou, and another will be placed in the marsh near the diversion of the W-14 canal (figure 1) to monitor hydrologic conditions pre-construction and post-construction. Water level will be monitored in 1997-1999 (pre-construction) and in 2000-2005 (post-construction). Upon collection of this data set, the TAG will assist the CRD Monitoring Manager with evaluation of the data and development of a sampling plan based on an approximate 30% reduction of effort, if technically advisable.

4. Water Flow

To monitor the increased flow of water into the project area at the Salt Bayou culvert, water flow will be measured at the same locations where continuous recorders are present. Current meters will be deployed and cross-sectional channel transects will be conducted to characterize the vertical and horizontal flow structure (Boon 1978, Kjerfve et al. 1981) and to calculate the instantaneous volume flux through the channel (Swenson and Chuang 1983). The meters will be deployed for a period from September/October through April/May prior to construction and for the same time period after construction.

5. Vegetation

Species composition and relative abundance of vegetation will be documented in 1997 (pre-construction) and in 2002, 2005, 2008, 2011, 2014 and 2017 post-construction along vegetative transects in the project area and the reference area. The Braun-Blanquet technique will be used to measure sites along the transects in a minimum of 1-m^2 plots. Information of herbivory and SAV occurrence will be recorded during the measuring of the vegetative stations.

Anticipated Statistical Analyses and Hypotheses

The following hypotheses correspond with the monitoring elements and will be used to evaluate the accomplishment of the project goals. If the null hypothesis is not rejected, possible negative effects will be examined.

1. Descriptive and summary statistics will be used on both historical data and data collected post-project implementation to assess changes in marsh loss rates over time and to assess whether the post-project marsh loss rate deviates from the expected 'future without project' condition. Descriptive and summary statistics will be used to compare annual marsh loss rates in the project area with that of the reference area.

2. The primary method of analyses for salinities will be to determine differences in mean salinities as evaluated by an ANOVA that will consider *both* spatial and temporal variation and interaction. The ANOVA approach may include terms in the model to adjust for station locations, proximity to structures, and seasonal fluctuations. Ancillary data (i.e. precipitation, historical) will be used when available. This additional information may be evaluated through analyses such as: correlation, trend, multiple comparisons, and interval estimation.

   Goal: Decrease mean salinities.

   Hypothesis:

   H_0: Salinities within the experimental area at time point i post-construction will not be significantly lower than salinities in the experimental area at time point i during pre-construction.

   H_a: Salinities within the experimental area at time point i post-construction will be significantly lower than salinities in the experimental area at time point i during pre-construction.

3. Descriptive and summary statistics will be used on both historical data and data collected pre- and post-project implementation to assess changes in water flow over time.

   Goal: Increase water flow into the project area through increased culvert at Salt Bayou.

4. Descriptive and summary statistics will be used on both historical data and data collected pre-and post-project implementation to assess changes in vegetation over time.

Notes

1.	Implementation:	Start Construction:	September 1, 1998
		End Construction:	February 1, 1999
2.	NRCS Point of Contact:	Marty Floyd	(318) 473-7690
3.	DNR Project Manager:	Steve Gammill	(504) 342- 6690
	DNR Monitoring Manager:	Shannon Holbrook	(504) 342- 6750
	DNR DAS Assistant:	Brian Zielinski	(504) 342-4123

4. The twenty year monitoring plan development and implementation budget for this project is $915,647. Progress reports will be available in February 2000, February 2001, February 2003, February 2004, February 2006,February 2007, February 2009, February 2010, February 2012, February 2013, February 2015, and February 2016, and comprehensive reports will be available in February 2002, February 2005, February 2008, February 2011, February 2014, and February 2019. These reports will describe the status and effectiveness of the project.

5. If the proposed reference area is adequate as a reference area for vegetation, ANOVA will be used in the statistical evaluation of the vegetation component.

6. References:

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Kjerfve, B. J., and H. N. McKeller, Jr. 1980. Time Series Measurement of Estuarine Materials Fluxes. in Estuarine Perspectives (Kennedy, V.S., ed.). Academic Press, New York. pp. 341-357.

Kuniansky, E. L. 1985. Hydrology of Fritchie Marsh, Coastal Louisiana. U.S. Geological Survey, Water Resources Investigation Report 84-4324, Baton Rouge, Louisiana.

Steyer, G. D., R. C. Raynie, D. L. Steller, D. Fuller, and E. Swenson 1995. Quality management plan for Coastal Wetlands Planning, Protection, and Restoration Act monitoring program. Open-file series no. 95-01. Baton Rouge: Louisiana Department of Natural Resources, Coastal Restoration Division.

Swenson, R. M., and W. S. Chuang 1983. Tidal and Subtidal Water Volume Exchange in an Estuarine System. Estuarine, Coastal and Shelf Science. 16:229-240.

U.S. Department of Agriculture, Soil Conservation Service 1990. Soil Survey of St. Tammany Parish, Louisiana. 141 pp. New Orleans, Louisiana: United States Department of Agriculture, Soil Conservation Service.

_____ 1992. Fritchie Marsh Restoration, Candidate Project for the Priority List of the Coastal Wetlands Planning, Protection, and Restoration Act. State of Louisiana and Soil Conservation Service.

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